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COORDINATING SUPPLY RELATIONSHIPS: RHETORIC AND REALITY

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Research Paper no. 1/07

COORDINATING SUPPLY RELATIONSHIPS: RHETORIC AND REALITY

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Abstract

Two reciprocally interdependent, dyadic supply relationships – one inter-organizational, the other intra-organizational - were investigated across a broad front in this study. The focus was on the logistics relationship between supply partners, and on how these relationships were co-ordinated in practice. We probed co-ordination between the partners using four constructs – goal congruence, information sharing, co-ordination mechanisms and joint decision making. Based on these two studies, we propose that the process of mutual adjustment creates a 'together-separate' tension that has to be managed in practice. This process may lead to the development of new capabilities that transcend the boundaries of the firm: equally, it is a fragile process that may be thrown into reverse by a variety of factors such as people turnover and failure to maintain established co-ordination mechanisms.

Keywords: Supply relationships, Logistics, Coordination

1. Introduction

The notion of the supply chain as a network of processes fits comfortably with the operations management (OM) principle of transforming raw materials and information into products and services which are valued by end customers. The network can be viewed as an 'extended enterprise', a group of strategically aligned companies focused on specific market opportunities (Greis and Kasarda, 1997) by exploiting collective capabilities. The term 'enterprise logistics' (from an earlier version by Wolfe, 1990) was proposed as a concept for integrating logistics activities within and between the transformation processes of the extended enterprise. In their study of fit between enterprise logistics capabilities and supply chain structure, Stock *et al* (2000) argue that a 'new and expanded role for logistics will be required in the new extended manufacturing enterprise'. This new role 'will place high priority on both inter-firm and intra-firm integration of logistics activities'. Such considerations have led scholars to consider how the new structures should be configured and coordinated (for example, Rudberg and Olhager, 2003. Authors such as Speckman *et al* (1998) and Barringer and Harrison (2000) call for a clearer understanding of the practices that facilitate the operation of logistics activities between parts of a multi-national firm, or between members of a network that are implicit in the 'single entity' view of the extended enterprise.

While terms such as extended enterprise and supply network are still in need of clearer construct development, the challenge is to design and manage 'a network of interdependent relationships developed and fostered through strategic collaboration' (Chen and Paulraj, 2004). Two of the key factors in developing interdependent relationships between buyer and supplier dyads are reducing the number of suppliers, and developing long term relationships with the chosen few. As an example of such interdependence, Carillo (2004) describes the evolution of GM and Delphi Automotive Systems (a GM spin-off specializing in parts and components, now re-named as Delphi) in Mexico. The Mexican operation has been a subset of GM's global policy of externalizing auto parts and subassemblies, and maintaining final assembly and the production of engines in-house. It has also reflected GM's policy of maintaining fewer but more closely integrated suppliers, replicated down the supply chain. Evolution of the relationship has created 'third generation' plants which can innovate in products and processes, and which are globally competitive on costs and quality. It has also created a situation where the two organizations are vulnerable to each other's wider problems (see for example Welch and Henry, 2005).

There are, however, few empirical studies of closely interdependent supply relationships in the academic literature. Most scholars have viewed interdependence from a theoretical perspective (Thompson, 1969; Richardson, 1972; Borys and Jemison, 1989), thus leaving a gap in our understanding of the reality of the detail of these complex processes. The need for internal consistency has been widely commented on, largely in disciplines other than OM. For example the 'typology of organisations' (Adler and Borys, 1996:78) proposes a 'fit' between the type of formalisation (enabling or coercive) and the relative routineness of the task. Other studies of internal consistency develop the argument for 'bundles' of HR practices (McDuffie, 1995), or for human resource management (HRM) systems (Becker and Huselid, 1998). Studies on external consistency are less common. However empirical evidence concerning HRM issues within inter-organisational relationships has begun to emerge (Hunter *et al,* 1996; Scarbrough, 2000; Rubery *et al,* 2004). So far, these studies of interdependence have looked at the relationship from the perspective of only one organization.

Our interests in exploring the extended enterprise led us to select dyadic supply relationships as our units of analysis. By taking a logistics perspective, we conducted empirical studies to probe the co-ordination of two such relationships that had developed around the physical flow of materials and associated exchange of information. We sought to identify and to compare the co-ordination of supply relationships in organizational terms in interdependent supply contexts. We operationalised our aims by directly studying in depth (Langley, 1999) both sides of two dyadic supply relationships. The first was between separately (US-) owned partners in the chemical industry in the UK, the second between French and English units of a French-owned pharmaceutical firm that worked on different stages in the manufacture of a drug.

Our article is divided into four further parts. First, we review the co-ordination of supply relationships; second, we explain our research methodology; third, the backgrounds of each case are presented together with findings from the cross case analysis. Finally, conclusions of the study are made, and avenues for future research identified.

2. Co-ordinating supply relationships

Adapting Quinn and Dutton's (2005) definition, co-ordination is 'the process people use to create, adapt, and re-create [supply relationships]'. Thereby, 'people arrange actions in ways that they believe will enable them to accomplish their goals'. This definition helps draw out the role of organizational factors (such as congruent goals and information sharing) in the co-ordination process. Lack of co-ordination in supply relationships or

'rules of the road' means that 'everyone will be interfering in the plans of others' (Sen and Sekaran, 1998). The role of co-ordination in supply chain integration tactics has been developed from a logistics perspective by Frohlich and Westbrook (2001). They identify two types of integration, the first of which is 'co-ordinating the forward physical flow of deliveries between suppliers, manufacturers and customers'. The second type of integration involves 'the backward co-ordination of information technology and the flow of data from customers to suppliers'. However, their 'arc of integration' does not attempt to address *how* relationships are co-ordinated in practice, and their views of integration remain at the level of sequential interdependence, a point we next address.

Thompson (1967) defines co-ordination in terms of the protocols, tasks and decision mechanisms designed to achieve concerted actions between interdependent organisational units (Kumar and van Dissel, 1996). He identifies three ways in which units may be dependent on one another. The first is *pooled* interdependence, whereby units share and use common resources but are otherwise independent. An example is shared use of a third party logistics service provider's distribution centre and transportation network by a number of otherwise independent users. Second is *sequential* interdependence, where units work in series and the output from one becomes the input to the next. An example is the supply of salt to the state of Minnesota for gritting roads in winter. Third is *reciprocal* interdependence, in which the outputs of each become the inputs for the others. Each unit poses contingency for the other, and co-ordination takes place by mutual adjustment (Thompson, 1967:54-56). An example is the GM-Delphi relationship we referred to earlier. 'Increasingly heavy burdens' are placed on information sharing and decision making in moving from pooled to sequential to reciprocal situations. Sequential interdependence describes the traditional, unidirectional logistics view of buyer-supplier co-ordination (source→make→deliver). Reciprocal interdependence describes bi-directional logistics co-ordination (source ⇔ make ⇔ deliver).

Reciprocal interdependence requires the most elaborate form of exchange (Thompson, 1967; Richardson, 1972). Such exchanges are characteristic of firms that have established long term relationships (Gadde and Snehota, 1995), and which require mutually beneficial adaptation of existing structures (Richardson, 1972; Hallen *et al,* 1991). Such inter-firm relationships exhibit sunk assets (high specificity), frequent transactions and uncertain contexts (Ring and Van de Ven, 1992), which would normally fall under hierarchical governance modes. This context is clearly different from the 'arm's length' type of relationship where the principal information shared is price and what is purchased (Powell, 1991; Ring and Van de Ven, 1992).

From a logistics perspective, the challenge is to co-ordinate a wide range of types of business process (such as manufacture, distribute and sell) across supply networks. The challenge can be subdivided into intra- and inter-company aspects. Thus, Romano (2003) states 'the concept of integration as a mechanism to support business processes across a

supply network is closely related with the effort to overcome intra- and inter-organisational boundaries'. We review each of these aspects in turn.

2.1. Intra-firm co-ordination

Internal integration has typically been viewed from three angles. These are (1) functional integration (Stock *et al*, 2000, Pagell, 2004); (2) the complexity of managing decentralised organisation structures in as much as sites often have to work together to deliver product, while reporting to different divisions or business units within the corporation (Lee and Billington, 1993); and (3) design-process integration practices like concurrent engineering, design for manufacturability and standardization (Droge *et al*, 2004). Pagell's (2004) model of functional integration between operations, purchasing and logistics proposes a complex phenomenon driven by a number of factors including the structure and culture at the plant, reward systems and the amount of formal and informal communication across the functions. He found no distinction between single and multiple plant systems, although the small sample size (11 plants) meant this was an uncertain conclusion. Pagell's study centres on closely-related functions: further distortion to intra-firm co-ordination can be caused by functions that have more distant relationships. For example, Hill (2000:26) has referred to lack of integration between marketing and operations as 'the great business divide'.

Most authors argue that internal co-ordination is the essential pre-cursor to external co-ordination (for example, Romano, 2003). But internal divisional boundaries are often inhibitors to the flow of materials and information as much as are boundaries with external supply partners. Multidivisional corporations often decentralise control over internal buyer-supplier relationships and adopt market-like incentives to govern interdivisional supply relationships (Lee and Whang, 1999; Walker and Poppo, 1991). Thus, co-ordination within divisions can be favoured over co-ordination between them and relationships with external suppliers are found easier to manage than internal relationships (Eccles and White, 1988; Walker and Poppo, 1991).

2.2. Inter-firm co-ordination

Many firms have been dismantling their vertically integrated supply structures because they are too slow to respond to market changes and too costly. For example, most automotive assemblers and aerospace prime manufacturers have greatly reduced the number of direct suppliers by appointing logistics integrators who take over responsibility for a whole family of parts and the associated operational complexity of planning and

controlling them. Interdependence among members of the supply network increases accordingly: the most critical element 'is the adaptation of the competitive behavior of individual supply network members to a joint regime' (Romano, 2003). Being a good partner in a network has 'become a key corporate asset' (Kanter, 1994). And Droge *et al* (2004) use constructs of supplier development, supplier partnering and closer customer relationships in developing their view of strategic inter-firm integration. Such constructs model a view of integration between firms across a broad front characterized by reciprocal interdependence.

Breaking up centralized supply structures has created new challenges for integrating the flow of information and materials, such as developing the capabilities of the integrators to manage the expanded co-ordination tasks. Kumar and van Dissel (1996) propose that the structure of inter-firm relationships develops according to the level of pre-specification of co-ordination mechanisms, a view supported by Romano (2003).

3. Analyzing supply relationships

In exploring inter-organizational relationships, we are confronted by the huge size of the literature (for example, Barringer and Harrison, 2000), and by the broad spectrum of methods that have been used to research them. Tackling this problem from a strategy perspective, Dyer and Singh (1998) refer to two prominent views of gaining superior returns from inter-organizational relationships. First is the industry structure view, where a firm may be embedded in an industry with favorable structural characteristics. Second is the resource based view (RBV), where a firm may accumulate resources and capabilities that are scarce or difficult to imitate. They also propose a third – the *relational view* – where the (dis)advantages of a firm are linked to the (dis)advantages of the network of relationships in which it is embedded. This view, which we adopted in our study, focuses on the dyad [/network] routines and processes as the unit of analysis. Support for the relational view comes from Sobrero and Schrader (1998), who argue that the single relationship rather than a firm or set of firms should be the unit of analysis. We focused on the logistics relationship between supply partners, again narrowing the field of multiple relationships between the same partners.

Using the 5-stage research process model of Stuart et al (2002), we set out to undertake our study of supply relationships by considering dimensions across a broad front so that we could engage with the multi-faceted nature of these relationships in practice. Following other scholars such as Jap (1999) and Chen and Paulraj (2004), we directed our attention to the buyer-supplier dyadic relationship in order to focus on co-ordination

in the context of reciprocal interdependence. We identified the following research question:

How does co-ordination work within the context of reciprocally interdependent supply relationships?

Based on our review of coordinating supply relationships in section 2 above, we selected four organizational factors that have often been used to describe the buyer-supplier co-ordination process: goal congruence, information sharing, co-ordination mechanisms and decision making. While these are by no means exhaustive, our aim was to develop a framework for analysis that enabled us to probe the co-ordination process across a broad front.

We selected case study methodology as our research strategy in order to facilitate understanding of the selected organisational factors in the context of supply relationships. This involved developing a clear definition of the unit of analysis in terms of the 'relationship' (see section 3 above), its organisational specification (the team or group of employees who interacted within 'the relationship'), its physical location (the manufacturing units where the main activities pertaining to the relationship took place), and its temporal extent.

3.1. Sample selection

Two organizations were selected opportunistically to provide the detailed and broad-based access needed to conduct our enquiries. Both featured supply relationships involving large, multi-national companies that could be described as highly interdependent and long term in nature. The first case was based on the inter-firm relationship between two organisations in the chemical industry which we call 'Wheatco' and 'Chemco'. While both were US-owned, Wheatco and Chemco were physically situated next to each other on a site in the UK. The second case was based on an intra-firm supply relationship between the drug manufacturing and finishing divisions of a pharmaceutical organization we call 'Tyrenco', which were situated in France and the UK respectively. Both cases were set in highly proceduralised, chemical industry environments. Both could be described as reciprocally interdependent supply relationships. Both logistics relationships were under pressure as a result of recurrent technical problems. We studied Chemco/Wheatco and Tyrenco for consecutive, nine-month periods. Brief contextual details are provided in the next section.

3.2. Contexts and Units of Analysis

In this section, we summarise the operating contexts of the supply dyads, and explain how we arrived at the specification of the units of analysis.

3.2.1. Wheatco-Chemco

Wheatco and Chemco are two US chemical corporations, both leaders in their chosen fields and with similar sales (around $2bn). Ten years prior to our study, the two companies formed a partnership with the strategic objective of gaining competitive advantage through mutual access to low-cost raw materials. One outcome was the establishment in the UK of a small Chemco facility (70 employees) which was sandwiched between two of the units within a large Wheatco plant (700 employees).

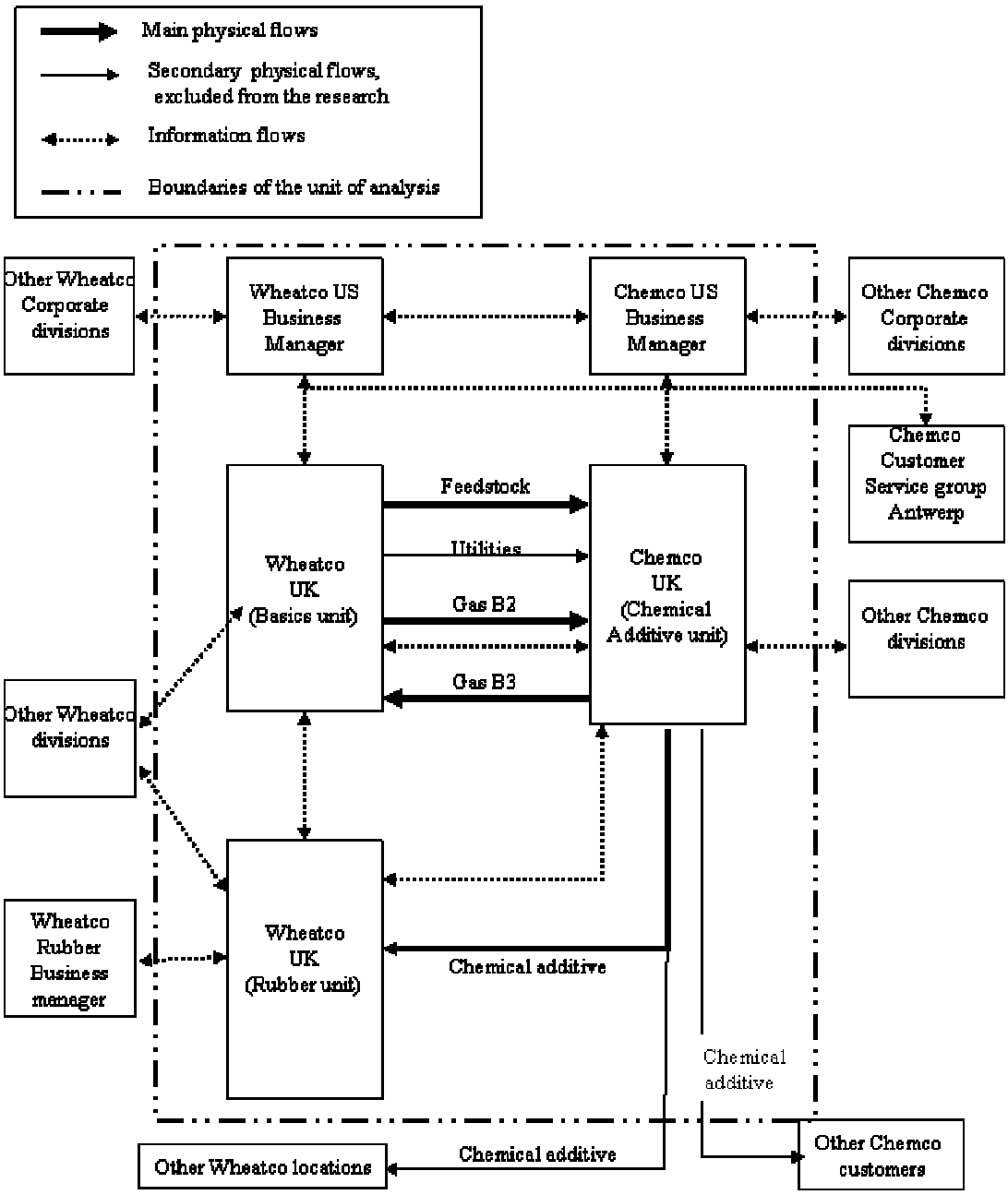
While a fence divided the two plants, selected employees were able to pass between the two by means of swipe card access. A Chemco manager commented:

> *"We are symbiotically linked. If you take away the Chemco and Wheatco signs, we're really one site…we have a relationship and it's an umbilical cord."*

Chemco was dedicated to production of a chemical additive used in the production of rubbers, paints and other compositions. The feedstock used in the Chemco process was supplied by the Wheatco 'Basics' unit. The manufacturing process of the additive generated a gaseous by-product, which was recycled back into the Wheatco feedstock. Half of the additive made on the Chemco site was sold to Wheatco's 'Rubber' unit, and the rest to other customers in Europe and the USA. The two firms thereby formed a 'closed loop' supply chain, whereby they were customer of, and supplier to, each other. The production processes operated on a round-the-clock basis and there was very little buffer stock within the supply loop. This close interdependence of the processes meant that the operating teams were in contact on a 24-hour basis. There was a direct telephone link between Wheatco and Chemco, colloquially referred to with typical Anglo Saxon humour as the 'Batphone', which allowed easy communication and warning of any problems or schedule changes to either of the processes - or to inform of forthcoming production shutdowns.

Figure 1 shows how we defined the unit of analysis based on material and information flows between the two organizations for the additive described above.

Figure 1: Bounding the unit of analysis: the Wheatco-Chemco supply relationship

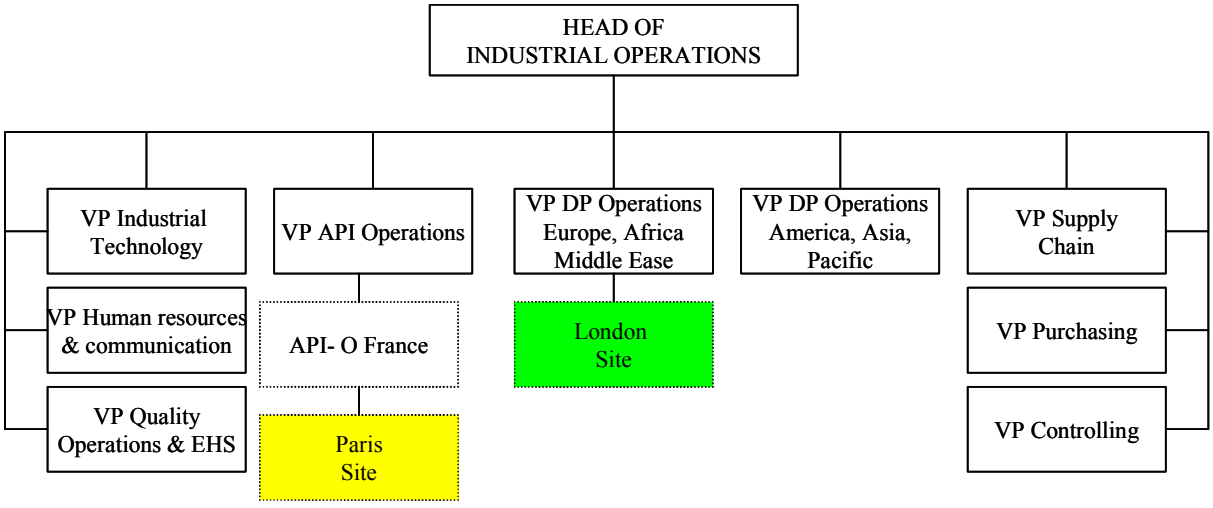


The logistics relationship was multifaceted, with interactions taking place at many levels. In the USA headquarters of both firms, an executive contact was appointed to manage the relationship at a strategic level, especially in regard to the global contract agreement. This provided the commercial terms for the relationship. Locally, the interactions included plant management, engineers and operators. A joint Steering Committee determined the local operational strategy for the relationship and provided guidelines to two other joint teams: quality improvement and technical.

3.2.2 Tyrenco Paris and London

The result of a recent merger, Tyrenco ranked among world leaders in the discovery, development and marketing of innovative pharmaceutical products. In 2000, Tyrenco launched a supply chain initiative called 'SPAN', aimed at improving the supply chain processes of its leading products. The program emphasized three priorities: new processes, new technology and organizational alignment. This third aspect aimed at improving integration within Industrial Operations between 'Active Product Ingredient' (API) manufacture (the upstream chemicals business) and 'Drug Products' (DP - the downstream pharmaceutical operations). Figure 2 shows the API and DP reporting relationships, together with the respective London and Paris manufacturing sites:

Figure 2: Tyrenco Industrial Operations organisation chart



We focused on the logistics relationship between the API site in Paris and the DP site in London. This relationship centred on the manufacture of T-drug, one of Tyrenco's strategic products used in the treatment of breast cancer. Manufacturing of the active ingredient, D-Synth, took place in Paris. This intermediate was then shipped partly to London and partly to the T-drug unit in Paris. Manufacture of the T-drug solution was dual-sourced between Paris and London, while the final production steps, together with inspection and packaging, were only performed in London. In parallel with the SPAN initiative, a 'mother plant' initiative dealt with the regulatory and quality issues between the two sites. In the case of T drug, London was made responsible for documentation, traceability and technical data exchange. A Paris manager commented:

> *"The commercialised drug product is made by London, Paris is a contributor to the manufacturing of this drug product. So the relationship is* de facto."

The two sites reported to different regional heads (the VP's of API France and of DP EMEA respectively) and worked separately from each other. However, the introduction of SPAN sought to align the two sites as key owners of the strategic T-drug supply chain, thus forging closer links amongst a wider range of managers and employees across the two sites.

Figure 3 shows how we defined the unit of analysis based on material and information flows between the two sites.

3.3. Interview protocol

A feature of the research design was semi-structured interviews with a wide cross section of employees and managers within each of the two dyads (48 in one and 36 in the other). The aim was to collect data, which was 'pluralist', hence describing competing versions of reality (Pettigrew, 1990). We sought to adopt a multi-perspective approach, and to avoid 'elite-bias' by drawing on the perspective of informants at different levels in the relationships studied. These levels included operators, process engineers, and local and corporate management, as shown in Table 1:

Figure 3: Bounding the unit of analysis: Mapping the Tyrenco Paris-London supply relationship

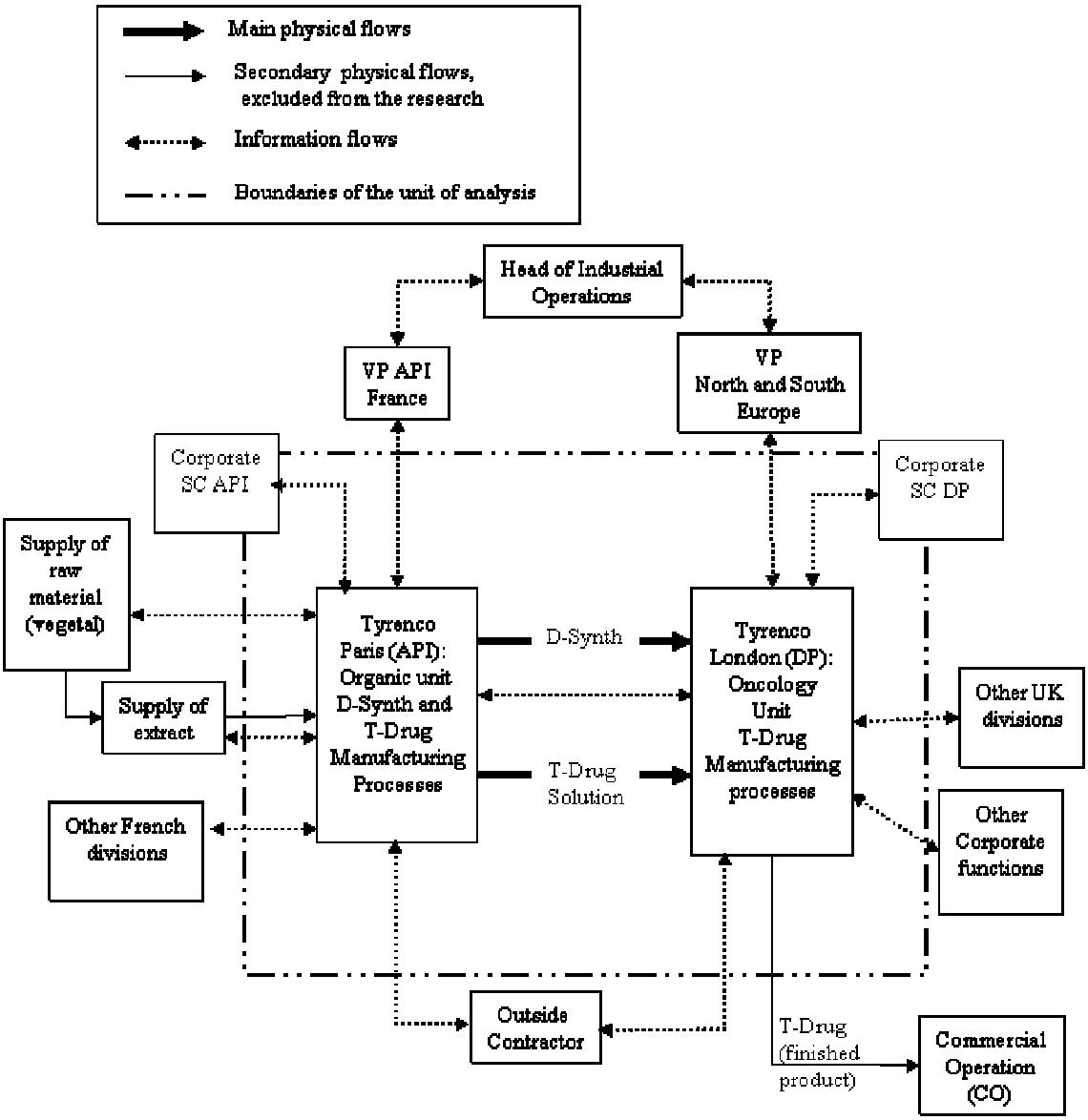


Table 1: Informants for both cases

	Wheatco	Chemco	Total
Operators	3	4	7
Engineers	8	10	18
Management	6	3	9
Corporate	1	1	2
Total	18	18	36
	Tyrenco Paris	Tyrenco London	
Operators	2	3	5
Engineers	1	6	7
Management	7	7	14
Corporate	1	3	4
Total	11	19	30

The rationale for the choice of informants was to have a broad range of interviewees from each of the units involved in the supply relationships, as well as broad functional representation across levels. The approach was to start with key managers in charge of the relationship and to follow leads from these initial interviews. Especially revealing were the views of corresponding informants on the other 'side' of a relationship. One of us is bilingual in English and French.

The main wave of data collection was complemented with subsequent interviews in order to check evidence through 'peripheral sampling', or to gather new knowledge on the way some individuals saw the relationship evolve over the course of the research. Interviews with corporate informants provided an alternative perspective on the local situation whilst allowing a view of the case from interconnected levels of analysis (Pettigrew, 1990).

Interviews began with an introductory phase, where key objectives of the research were explained. The informant's role in the relationship was then discussed, together with his interface with the other firm. The next stage of the interview centred on the informant's perceptions about characteristics of the supply relationship. Finally we explored perceptions about the co-ordination of the supply relationship and the 4 factors we used to characterise it. The interview guide we used in our research is shown in appendix 1. The length and protocol for conducting interviews evolved over the course of the research. Interviews tended to be rather informal and longer (from 2 to 3 hours), in the early stages to provide an in-depth understanding of the research settings. During later

stages, they were more focused and structured in order to provide specific additional evidence or to verify earlier research findings (Pitman and Maxwell, 1992).

3.4. Other data sources

The study drew on other sources such as documentation and observation. Some documents, such as joint meeting minutes or contract agreements were directly relevant to the topic of the study. Others, such as company brochures or organization charts pertained to the context at company or site level. Each study took place over a 9-month period, which permitted the achievement of familiarity with the setting whilst not becoming over-involved (Pettigrew, 1990); this also allowed us to capture longitudinal aspects of the relationships.

3.5. Quality in research design

Rigor in case study design was addressed by Yin's (2003) four tests. Construct validity was sought by drawing on multiple sources of evidence for each case. Further, a report of our observations and conclusions was provided to each organization. Findings were also presented to key informants in order to confirm the observations we had made. Internal validity was sought by using the 'relationship' as a common construct to determine the units of analysis. Using similar research instruments across both cases facilitated cross-case comparisons. Replication logic guided the execution of the second case. The comparison with theory provided the basis for analytical generalization in order to link the conclusions to other theoretical views (external validity). Finally, reliability was sought by using a protocol to guide data collation and analysis. N'Vivo® software (Gibbs, 2002) provided an electronic database and analytical capability that was complemented by other documentary evidence in paper form.

4. Within-Case Analysis

We present in this section our findings from the four organizational factors, for the two relationships studied. We refer to the Wheatco⇔Chemco relationship as Wh⇔Ch, and the Tyrenco Paris⇔London relationship as TyP⇔L.

4.1. Goal Congruence

The study of goals within both supply relationships showed that they were stratified along three levels: strategic, operational and site goals. Strategic goals were linked into the high level key result areas at corporate level, operational goals measured the performance of the local supply relationship and site goals were the drivers for the performance management system.

4.1.1. Wheatco⇔Chemco

Within Wh⇔Ch, no explicit strategic goals were articulated as a high-level mission to guide the local relationship:

> *"Nowhere have I seen this high level mission. I had to find out about this relationship by practicing it, by having the meetings, by having the discussions, by finding out about how the relationship worked"* (Chemco manager).

This meant that learning about the relationship was derived from tacit, rather than explicit knowledge. However, there was a clear vision of the shared local operational goals, which were articulated around process reliability (online time), product quality and supply. The objectives were articulated within the technical and quality teams (QIT) and we saw evidence that these goals were translated into individual employees' performance objectives.

Whilst the local relationship required goal sharing in order to be able to operate, this did not preclude the fact that there was a feeling of separateness and a concern for the benefit of the 'home company'.

> *"Where ultimately our only interest is what is best for Chemco. I still wonder whether everything that we do really benefits Chemco or not"* (Chemco engineer) *"They are maybe more keen in looking after their own needs" (*Wheatco engineer) *"Sometimes we think that they don't do as much as we do."* (Wheatco management)

One difference with regards to goal setting at both firms was that, whilst the Chemco site goals had a direct link into the relationship goals, this was not the case for Wheatco. Here, the variable compensation plan was based (beside corporate criteria) on the whole site performance, rather than on that of individual manufacturing units. This generated a perception of imbalance, especially at shop floor level. A Chemco engineer commented:

"They've had a terrible year and still got good recognition. It doesn't motivate them to succeed, does it?"

4.1.2. Tyrenco Paris⇔London

Tyrenco informants viewed their top-level goals, embodied in the strategic product line and cancer application, as impetus for joint work between the two sites. Conversely, informants agreed that there was a lack of joint operational goals. The key reason for separation of the two sites was organisational. As described above, the reporting relationships of the two sites was to separate divisions.

> *"In the TyP⇔L relationship, you have API France vs DP EMEA. So you have two boundaries there"* (Paris Management).

There was a perception of conflict in that success in achieving one site goal - for example budget or inventory - could come about at the expense of the other site. For example, the measurement of inventories was not at overall supply chain level, there was a tendency to overlook the logistics logic:

> *"What are the forecasts, the needs, what are the product cycle times and the buffer stocks and this is valued in order to follow a financial logic: we end up managing inter-company margins rather than inventories"* (Corporate manager).

Thus financial issues were at the core of the inter-site rivalry. A London manager stated:

> *"When the subject of individual site budgets and budgeting control comes up, then that's a big issue and that's where there is a kind of war zone area. The way those monies are controlled across the sites is in direct conflict."*

4.2. Information sharing

Information sharing was at two levels: technical information that needed to be shared in order to jointly resolve quality issues, and information pertaining to logistics and process co-ordination.

4.2.1. Wheatco⇔Chemco

Overall, information appeared to flow openly and freely within the Wh⇔Ch relationship. The flow of information was secured through an agreement of confidentiality and non-use, which was included in the contract and bound both firms and their employees:

> *"I don't think you can have a relationship like ours and not have that kind of sharing and openness with each other"* (Chemco Management).

There was limited clarity as to where to draw the line on information sharing. Openness had also to do with being open about what could not be shared. There was little in the way of formal guidelines in regard to how much information should flow between the two plants. This was perceived by some informants as missing, especially because there was a culture (particularly at Wheatco) of being very private and secretive about the technology. Such boundaries were lessened to some extent because some socialisation was allowed at operator level, who "say what's on their mind" (Wheatco management).

We observed the impact of several quality problems, which helped foster more extended communication within the relationship as they prompted more interaction.

> *"We've had some difficult problems to solve which has perhaps meant that we have had a lot more communication… that's accelerated the process of getting to know each other"* (Wheatco engineer).

Centred on timely co-ordination of the joint manufacturing process, the procedural co-ordination took several forms, imposing varying degrees of formality on to the daily operations. These included complaints, forms and specifications:

> *"a little bit more defined in terms of why are you rubbish or you're not as good as you were"* (Wheatco engineer).

Defining the communication lines was deemed necessary in view of the broad interface between the three manufacturing units, which could induce a distortion of the information flow and reduce its efficiency. Structuring the communication lines was achieved through a communication protocol:

> *"Increased breakdown events have revealed weaknesses in our systems: this e-mail is meant to bring clarity to this situation - who should call who and in what circumstances"* (Chemco Operations Manager)

Defining a new communication protocol entailed communicating information on the internal work structure, such as telephone lists and organisation charts. Here we have an

example of the adjustment process and the 'increased burdens' placed on communications referred to by Thompson (see section 2 above).

Inability to work with people face-to-face was perceived as hindering information sharing. Indeed, indirect modes of communication such as telephone or e-mail were perceived as making information sharing more difficult than direct face-to-face interaction. Here is how it was illustrated:

> *"I'd like to see Wheatco come in over here, I'd like to see us going back over there regularly. Sometimes you've got to spell it out what impact, say, our chemical additive is having on their rubber manufacture"* (Chemco engineer).

4.2.2. Tyrenco Paris⇔London

Several informants described information sharing within the TyP⇔L relationship as lacking transparency. This seemed to prevail in particular among Paris informants:

> "*We suffer from a lack of reactivity, of transparency, of clarity. We always get evasive responses, no yes or no* (Paris management) *It's really difficult for us to understand what's going on over there. For us it is very opaque"* (Paris management).

Indeed, data such as T-drug production schedules, sales forecasts and batch result data were necessary for the Paris manufacturing units to operate smoothly. From London there was recognition that information was 'requested rather than given' (London engineer). One explanation was that the relationship involved multiple levels of interaction, but relied on few strong contact points. In particular, there was a lack of functional interaction between the two manufacturing units.

> *"What we haven't done effectively or consistently is get involved jointly the people who actually run the process"* (London management)

Other perceived effects were potential delays or missed opportunities for joint problem solving:

> *"You need to take the action away so if someone from production was there the issue could probably get resolved there and then"* (London engineering).

Lack of interaction appeared to drive the lack of this 'natural' inclination to communicate. The lack of communication was enhanced by the separate organisation structure we have already referred to.

Most informants agreed that the recent T-drug crisis had positively improved the relationship, because it had intensified the technical information flows between the two sites and forced more interaction.

> *"Because of the T-drug crisis issue, it is an obligation to communicate. London was forced to be transparent" (*Paris management). "*The focus on that as a crisis management or a problem management has forced London and Paris to work collaboratively"* (London management).

Informants argued that the best way to ensure that regular information sharing was maintained over time within the relationship, whether for logistics or for technical information, was to formalise the interaction process.

Because of the fact that the knowledge related to the oncology product line was embedded in both the Paris and London sites, there was an opportunity to build synergy and develop learning across the two sites, especially to meet the requirements of the Mother Plant Programme.

> *"We both have history. We're going to need to do something to collect all that history and share it so that everybody knows where in fact we collectively are today*"(London management)

There was agreement that a broader interaction between both sites would benefit the TyP⇔L relationship by setting up a network of communication lines across both sites. In particular, direct one to one interaction between QA, supply chain and manufacturing, as well as 'technical' was considered desirable. This was expected to allow increased information exchange and knowledge sharing, and improvement in operational co-ordination through a direct interface for problem solving. Indeed confining communication lines at management level tended to restrict information sharing and learning.

There was historically a high people turnover at London. This was disruptive for the relationship for three reasons:

1. It did not allow the benefits of previous socialisation to be reaped and was a barrier to networking. *We have invested a lot into some people who have gone. Whenever we start working well with one individual then he leaves and we have to start from scratch* (Paris management).

2. Established routines were interrupted. *It has not been so strong, with the changes that have happened since then* (London management).

3. The lack of personal relationship made it more difficult to relate. *This de-personalises the relationship, so that it is only an administrative one. You tend to have a contact only in case of issues and also it makes it more difficult to use the phone to call your interface in order to understand what's going on* (Paris management).

One consequence was that the contact points were not clearly identified, and some informants from both plants stated that it was far from clear about who their direct interface should be.

4.3. Co-ordination mechanisms

Co-ordination of the two supply relationships drew on legal, procedural and logistical mechanisms.

4.3.1. Wheatco⇔Chemco

Contracts between the two companies clearly positioned the relationship as long term:

> *"The contracts that we've signed are 20 year type contracts. We're stuck with one another, whether we like it or not. I think we're enjoying it"* (Wheatco Corporate).

This long-term horizon also resulted from the sunk, non-recoverable investments pertaining to the relationship, characterised by the closely linked manufacturing processes. There was no unity as to the extent to which the contract was a driver of the relationship. However, the general perception was that with such an interdependent relationship, it would be difficult and undesirable to attempt to capture all contingencies contractually:

> *"There are contracts but I think in this relationship it's a sad day when I pull out a contract and read it to my partner at WTC. The contract is just a piece of paper we have to write…we can have all the contracts in the world, this relationship is so multifaceted that contract or no contract, you just have to make it work."* (Chemco corporate).

Whilst the contract was viewed as 'setting the boundaries' for the local relationship, in fact its flexibility was a requirement to allow faster response and more efficient inter-firm cooperation.

The Wh⇔Ch relationship was characterised by a process-centred reciprocal interdependence, which resulted in a polarised perspective of the relationship, with collaboration and reciprocity at one extreme and a conflict and blame culture on the other. On the other hand, there was a strong perception of the reciprocity that was engrained in the awareness of the closely linked production processes. There was an immediate impact of one manufacturing unit on the other - due to the lack of buffer stock. This generated a view of the relationship as being 'intense' (Wheatco engineer) and 'intimate' (Chemco management). Intensity within the relationship also referred to the synchronised adjustment that was required for the operation of the production processes. This required systematic communication to allow simultaneous task co-ordination:

> *"If we need to change step we have to communicate with them"* (Chemco operator).

Co-ordination at process level was mostly by telephone. Problems were perceived as being shared, and resolution required joint investigation and co-ordination. Reciprocity thus appeared as the only route to shared success, in that co-ordination appeared to be an obligation:

> *"It's in everybody's interest in that circle to work together"* (Chemco engineering).

Task interdependence was also seen as a source of conflict. It entailed a frustration, which was rooted in process unreliability. Indeed shutdowns involved an underlying fear of having to carry the blame for shutting down the whole supply loop, described as:

> *"a worried feeling between the two plants that one was going to let the other one down"* (Chemco operator).

Periods of process unreliability were viewed as increasing the pressure on the operator:

> *"Through a 12 hour shift the feed trips then you put them back on then it trips again and it does wear you down if you're constantly having to start the plant up again. When the plant trips, then there are a number of things you need to look at…and to get the whole thing settled down…would take quite a few hours*." (Wheatco engineering)

In such instances, the downstream party perceived the dependency as not being reciprocated, which was interpreted as a feeling of lack of priority. Lack of understanding of what was happening in the other site's production process created a sense of frustration because of the strong interdependence.

4.3.2. Tyrenco

Mechanisms that regulated collaborative efforts within the TyP⇔L relationship were centred on the co-ordination of D Synth and T-drug. While supply of D-Synth was sequential co-ordination, T-drug solution required mutual adjustment, because of the very tight time-frame (35 hours) between manufacturing in Paris and the filling operation at London. Co-ordination of the physical product flow was achieved in practice by shipment of empty sterile vessels from London. The tight interdependence that characterised these operations was viewed as an element of reciprocity as well as a source of tension within TyP⇔L. The relationship was seen as grounded in operational co-ordination:

> *"The partnership is that we send them vessels…they can manufacture into, and then they send the vessels back. I think it is a good working relationship where we both understand each others' needs, and the needs meet in the middle with T-drug ending up in London"* (London engineering)

This was true for logistics co-ordination as well as for resolution of technical issues. Communication was perceived as centred on joint problem resolution:

> *"If we have a technical issue that we need to argue, we openly argue but it's a positive argument. It's an argument towards a conclusion and there's no hidden agendas... and it interacts in the way it should interact"* (London management)

Because of the logistics interdependence, co-ordination was perceived as an indispensable characteristic of TyP⇔L to ensure that appropriate product quality, supply and regulatory requirements were maintained:

> *"If people are working together, and they do not collaborate well, even if all procedures are followed, one day or another there could be a mistake or a problem with quality or a dysfunction" (*Paris management)

Causes of frustration between the two sites were at the level of task co-ordination, such as quality and availability of the vessels. The high number of schedule changes and late batch cancellations at London impacted on the internal Paris operation. Numbers of operators had to be changed at short notice, which put tension on the internal site operation.

4.4. Joint decision making

Here, there was often a conflict between local and corporate decision making, in other words, the degree to which a plant was free to engage with its supply partner without having to refer the issue to corporate levels. A further problem was the extent to which relationship needs prevailed over individual company needs.

4.4.1. Wheatco-Chemco

Short-term sacrifice for one of the partners may be necessary to achieve a 'win-win' situation at the level of the overall relationship. Reciprocal interdependence encourages partners to tolerate short-term inequities.

> *"My only very simple vision is: if Chemco and Wheatco were one company what actions are the most optimal?"* (Chemco corporate). *"Yes my counterpart and I have talked about really... we need to make decisions as if we were one company*." (Wheatco corporate)

Some individuals, however, especially those new to the relationship, were struggling to accept such a rationale that did not create immediate benefit for their company:

> *"When (he) came on board, his question was if we are doing something for Wheatco, what's in it for Chemco?"* (Chemco corporate)

Corporate managers may have been limiting communication about relationship strategy by expecting managers to draw on tacit rather than explicit learning modes (see 5.1 above).

While joint decision making took place to some extent within teams, details of the action planning of relationship operation were determined internally:

> *"Then we both come back and separately start to work on it"* (Chemco management). *"Internally we agree how it is we're going to tackle that, how we go about it, who's going to do what that sort of thing. So that's*

where the real action, the detailed action plan is laid out" (Wheatco management).

The bounding of local decision-making created frustration in that local management perceived themselves closer to the actual issues and therefore better able to make the right decisions than 'the people sitting in America'. This could affect local running of the relationship because it became difficult to make timely decisions. Reaction from local management was to take action locally and inform corporate after the fact:

> *"We have this Wheatco corporate link and then we have this local link and I think basically what I'm going to do in the future is make decisions and then ask them afterwards because it's quicker. What I do is go out and do it and then what tends to happen is that if I overstep what I'm responsible for someone will tell me."* (Chemco management) *"What we tend to do is that we will talk to Chemco locally and decide to do something and once we've done it, we tell the corporate people we've done it and that way they can't stop us ."* (Wheatco management).

Thus, collusion at local level was seen as a way to ensure that local priorities were met.

4.4.2. Tyrenco

Because the two sites had separate goal setting, the decision making processes were also perceived as being separate:

> *"Probably more decisions are made individually"* (London management)"
> *I do not see many joint decisions being made. Independent I think, at the moment that is how it is* " (London management).

Joint decision making was forced at operational level, to co-ordinate production schedules between the two sites. This took place between London planning and the Paris T-drug leader:

> *"It's the nitty gritty, looking at the schedule and determining the detail between myself and her"* (London engineer).

But the higher-level strategy pertaining to the split of yearly T-drug volumes was not clearly articulated. The decision about this split had a big impact on the profitability of each site because of the high value of T-drug. Therefore, the split of volumes was at the heart of inter-site conflict, and was perceived by both sides as impacting not just the short term budget but also the long term survival of each plant.

One perceived consequence of the separate site goals within TyP⇔L was that this might favour a local vs. an overall Tyrenco perspective.

> *"Decisions are made which are not for the benefit of the company"* (Paris management). *"Too focused on their own local needs rather than on thinking more globally"* (London management)

There were different interpretations of the 'mother plant' concept, and whether it involved being a lead site or a coordinating site. This had different implications in terms of the approach to decision making, and how much participation was permitted:

> *"What is difficult with this relationship is that there is one party, which is the order giver and one party, which is the order taker. So therefore there is one party, which has more control over the relationship than the other one."* (Paris management).

The perception of asymmetry in TyP⇔L was due to the fact that London was seen as having a higher control over the governance of the exchange than Paris, even though there was no perceived difference of status between both sites. Indeed T-drug was initially developed in Paris, so that this site was seen as having as much technical ability and knowledge of the product as London. The imbalance was centred around decision making concerning production planning, as well as on the perception of the 'mother plant' - which was perceived as dominant. However, joint participation in the decision making process was justified by the similarity of status and the history of TyP⇔L where both sites were contributing equally to the T-drug product.

> *"They are two large sites, with similar complementary resources. The relationship should not be that London dictates to Paris. It should be a more open, mature relationship."* (London management) *"There is equal experience among the 2 sites so we're starting from a different starting point. So for London and Paris the mother plant needs to be more of a collaborative versus an expert giving support to, you know mother and parent child sort of thing."* (London management)

Informants saw three pre-requisites for an efficient decision making process to take place within TyP⇔L:

1. Paris people were adamant that there should be clear rules to guide the decision making: *Rules of the game are clearly stated and accepted by everyone* (Paris Management).

2. Decision making should involve a dialogue: *I can't imagine that it will not be accepted bi-laterally. There should be some kind of negotiation*.

3. Impartiality should guide decision making: *Without any favouring of any of the parties* (Paris management). *Work with Paris on that so they believe and London believes that the solutions…are the best for the business, taking into account the needs of both sites* (London management).

An outcome of negotiation should be a shared ownership of the implementation:

> *"There should be shared responsibility and ownership* (Paris management) *So it's not so much a decision making process because that has to happen, but it's a clarifying what it means and then making it happen, so it's an ownership of the execution"* (London corporate). *"Getting a common view of what is the best business solution and jointly agreeing to that and going forward"* (London management)

There was a consensus, across levels and across sites that escalation of the decision making process through arbitration should be sought as a conflict resolution mechanism.

> *"What would be nice is that a high level person comes to arbitrate."* (Paris engineer) *"Where there is a disagreement between those 2 you have to seek higher resolution."* (London corporate)

One difficulty was to identify such an arbitrator. Given the existing organisation structure, there was no common hierarchical head. The next level at which an impartial view could be sought was at Industrial Organisation (IO) level.

5. Cross-Case Analysis

We analysed our within-case findings in Table 2 for Wheatco⇔Chemco, and in Table 3 for Tyrenco Paris⇔London. The two cases document mutual adjustment in practice, and allowed us to highlight three themes that expose the nature of the co-ordination of reciprocally interdependent logistics relationships in practice.

Table 2: Within-Case Analysis for Wheatco⇔Chemco

Factor	Wheatco⇔Chemco
Goal Congruence	Strategic goals are "win-win" at corporate manager level. *Strategic goals are not clear at local level; they are implicit and not articulated by corporate managers (stated, unwritten, emergent?).* Local operational goals are clear and shared: articulated within the management, technical and quality teams. Increased formalisation of objectives with the arrival of new people perceived as driving more accountability. *Disconfirming: Separateness and concern for own company benefit is expressed.*
Information sharing	Free and open information sharing. Through information sharing, joint learning can take place. Quality issues foster more communication and interaction. *Disconfirming*: *Not enough information sharing, maintaining confidentiality. Perception of retention of information at corporate level whereas locally there is an obligation to communicate, hence potential conflicting messages. Issue with information sharing and openness regarding process co-ordination. Limited amount of data transfer (no extranet)*
Co-ordination mechanisms	Contractual agreement positions the relationship as long term. No consensus to what extent it drives the relationship. It specifies the local team structure. Process-centred interdependence with a polarised view. At one extreme, collaboration, embodied in the 'one plant' view. Collaboration as an obligation. *At the other extreme, frustration around process unreliability and shutdown co-ordination. Perceived opacity of the other firm's production process. SOPs are separate and not always shared, therefore can be a source of misunderstanding.* Broad interface across both firms: multiple levels of interaction, mostly functionally driven with key points of contact. *Complexity of the interaction: distortion of the information flows due to a lack of formalised communication lines. Call upon hierarchy to validate information content seen as disruptive.* Tactics for reinforcing the relationship structure: defining a communication protocol, single points of contact, appointing dedicated resources. Inter-personal relationships are strong.
Joint decision making	'One company' heuristic, *but this rationale is foreign for new people*. Clarity of autonomy of decision making at local level: centred on operational issues. Perceived symmetry between the two firms. *Conflict between local decision-making and global consistency of business strategy at corporate level. WTC corporate take control over business decisions by funnelling through US Manager.* Collusion at local management level.

Normal script = enabling the relationship, *italic = inhibiting the relationship*

Table 3: Within-case analysis for Tyrenco Paris⇔London

Factor	Tyrenco Paris⇔London
Goal Congruence	Customer service (C/S) and joint operational co-ordination as shared goal although C/S measures different portions of the supply chain. Joint overarching goals: Strategic product and cancer application. *No explicit strategic direction for the relationship* *No joint operational goals; separate organisation structure. Local site objectives (inventory and budget) as source of conflict. Competition around product allocation, no win-win. Conflict is covert rather than overt. Market approach to inter-site exchanges as 'jokes, stupid, silly, irrelevant'.* Urge for goal setting process: clarity and coherence, compatible. SPAN as enabler. Potential joint objectives at global level. Product leader as providing alignment for inter-site work.
Information sharing	*Lack of transparency on both sides linked to a lack of interaction: production schedules, forecasts and technical data (Paris). Opaque, no sharing of problems. Through lack of interaction, no "natural inclination" to communicate (London). Focus on own site, organisational separateness. Other barriers to data sharing: no enterprise-wide technology, uncertainty of demand information.* SPAN supports end-to-end visibility and information symmetry (Paris). Product community entails a collaborative approach. Joint planning meetings are organised beside SPAN. Enhanced collaboration due to T-drug quality issue.,
Co-ordination mechanisms	Polar view: reciprocal: Operational co-ordination ('de facto' partnership) and collaboration around joint technical issues ('no hidden agenda'). Collaboration as indispensable characteristic. Contract with OC improves clarity and communication *Polar view: Frustration around task co-ordination and negative impact on both sites internal operations and with PM implication for PAR. Lack of yearly production programme for T-drug. Competition over the allocation of T-drug. No mechanism to encourage inter-site collaboration on PM.* *Past relationship based on single point of contact. Lack of interaction at functional level (manufacturing) hence missed opportunities for learning and problem solving. Contact points not clearly identified.* Strong interface defined for SCM (SPAN). Good interpersonal relationships with disconfirming data. Interest of broad vs. narrow relationship structure. Desired: Identify key contact points. Need to 'institutionalise' the interaction so that it does not occur only at crisis time. Balanced team structure (number and levels)
Joint decision making	Joint decision making at operational level *but lack of clear strategy for T-drug allocation.* New framework for decision -making (SPAN and Mother Plant). *Separate decision-making. Perception of imbalance and asymmetry around decision making on T-drug production planning and early understanding of Mother plant concept as 'dominant'. Recognition of local, parochial rationale vs. 'overall company benefit'.* Desired: Joint participations in decision making justified by similarity of status and equal contribution to T-drug. Desired: clarity of rules, dialogue and impartiality, to allow shared ownership of implementation. Steering committee as forum. Arbitration as conflict resolution mechanism.

5.1. Mutual adjustment and tension in the relationship

Relationships have been described as not showing a unitary picture. They involve a tension between the need to be close (togetherness) and the need to work separately (separateness), as illustrated in figure 4. The presence of this tension was very apparent from our data.

Figure 4: A polar view of supply relationships.

We concluded that logistical pressures promote togetherness in a relationship, especially via procedural mechanisms. If they did not involve contingencies such as product quality and process failures, then mutual adjustment would not be necessary. It is the contingencies inherent in the management of physical product flows that force mutual adjustment and the imperative to work together. Management of physical flows demand heavy-duty co-ordination between supply partners. This can be overlooked by partners who tend to focus on the contractual aspects of their relationship, and not on the procedural side.

Mutual adjustment appears as a tension between elements that bring the partners together, hence stressing the benefits of achieving shared success, as well as elements that are driving them apart. Separateness can be derived either from a failure to mutually adjust (because of various organizational reasons) or as the need to focus on the requirements of the internal organization.

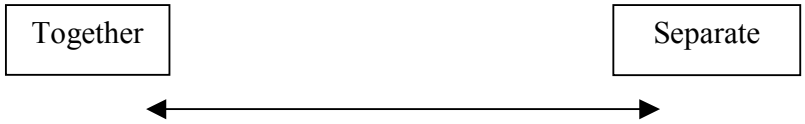
In the context of reciprocally interdependent relationship, interaction takes place at multiple levels. Therefore, depending on the levels, the view of the relationship can be different. This pertains not only to corporate and local levels, but also within each site -

hence creating a range of layers of interaction. Thus the Wheatco⇔Chemco relationship was close at management level, whereas there was a gap at operator level. This supports Sobrero and Schrader's (1998) views about the need for balance and alignment between contractual and procedural co-ordination mechanisms.

5.2. Mutual adjustment and capability build-up

The process of mutual adjustment develops new inter-firm procedures and routines and hence to new relationship-specific capabilities for both partners. These capabilities are invested into the co-ordination of the supply relationship, by for example building up joint goals and congruent decision making. Thus, mutual adjustment is resource intensive both in terms of time and personnel, and because the capabilities that are created are relationship-specific and cannot easily be redeployed to other relationships.

Figure 5: Enablers and inhibitors to supply relationships.



Congruent goals	*Labour turnover*
Shared information	*Bonus schemes not aligned*
Aligned coordination mechanisms	*Lack of explicit relationship goals*
Joint decision making	*Separate decision making*
Resolution of technical problems	*Opposite behaviour to 'together'*

This development process is cumulative and long-term in nature, but progress can be reversed at any time by the impact of contingencies such as those listed in figure 5. This supports the views of Ring and van de Ven (1992) that membership of collaborations tends to be in a constant state of flux with individuals, organizations and their priorities rarely remaining stable for more than a few months at a time. For example, labour turnover means that new starts have to be brought up to speed with status of current capabilities, and that progress towards togetherness is set back meanwhile. Resolution of technical problems usually promoted togetherness because such problems demanded increased co-ordination activity across a broad front. The togetherness pole is not

invariably the right direction either, because many decisions such as intellectual property favour a 'one plant' heuristic. Dynamics of the tension between together and separate poles of a reciprocally interdependent logistics relationship mean this is an ongoing management task that is not unidirectional in nature. In practice, the decision is not 'either-or', and managers have to decide how much togetherness to allow, by what means it will be administered (for example by setting time aside for group problem solving activities, or by using centralised or decentralised mechanisms), and how the results of developing togetherness should be measured and rewarded. Huxham and Beech (2003) offer supporting advice in that their research provides evidence that raising awareness of the types of tension that frequently arise can enhance practitioners' ability to manage them in a considered way in their particular situation.

5.3. Implications to the boundaries of the firm

It was apparent from our studies that firm boundaries tend to be blurred when the relationship is 'together', in other words there is an area of shared ownership between supply partners. This blurred area shrinks and becomes more formalised and structured when the relationship is 'separate'. Further, our two cases illustrate that development of a more 'together' type of relationship is a dynamic process that evolves over time. At some periods, partners became preoccupied with their own internal problems, and did not have time to devote to the relationship.

Consideration of what to include within the boundaries of the firm and what to share or outsource to the supply partners mirrors the analysis of mutual adjustment in the previous section. Mutual adjustment involves learning and therefore the development of new capabilities and new boundaries.

6. Contribution

We have organised the contribution of our paper in terms of understanding how coordination works in practice in supply relationships at four levels. First, our study explored the multifaceted coordination processes and practices that characterised the supply relationship between two large organizations in the inter-firm case, and two parts of a single large organization in the intra-firm case. This revealed the intricate nature of such coordination - which involves a large number of daily exchanges between the organizations concerned. We looked at multiple levels, and at the different loci of interaction (from operator to corporate level) which revealed very different perspectives on the relationship. These different strata of interaction were relatively impermeable to

each other. Our approach shows a more diverse picture than do studies which focus on boundary spanning agents (for example, Marchington and Vincent, 2004). We used four organisational factors to elicit the constructs of coordination and mutual adjustment as perceived by the actors tasked with building up the joint routines, processes and procedures needed to operate RI relationships. In both cases, we found situations where logistics processes were so interdependent that contingencies in one supply partner immediately impacted the other. Such interdependence was therefore characterised by mutual vulnerability and fragility. RI in practice appeared as asymmetrical, fuzzy, impermanent and under repeated re-negotiation. The last point echoes the views of Berger and Luckmann (1966:167) about 'reality maintenance'. Interdependent processes have to be the focus of continuous improvement and innovation, which take place at both organisational and individual levels.

Second, at an explanatory level, we found RI relationships contain 'arm's length' as well as 'obligational' elements (Sako, 1992). Our study highlights the concurrent tension between the need to work together and the pressure to be separate. This example of what Poole and Van de Ven (1989) refer to as a 'paradox' provides an enhanced insight into the multifaceted reality of coordination. We found that logistics processes lead to the development of relationship-specific capabilities that *evolve* as a result of coordination between partners over time. Such evolution of joint capabilities is necessary for the smooth operation of RI relationships in practice. The dynamics of the tension between together and separate poles of an interdependent logistics relationship mean that this is an ongoing management task – and that it is reversible in nature. Capabilities initially built up at the start of an RI relationship can reverse over time - for example due to lack of priority by either firm or by people turnover. Coordination has to be re-energised at times of crisis when partners are forced to re-invest resources. This extends Feldman and Rafaeli's (2002) view that routines support an organisation's ability to coordinate and adapt by highlighting their role in an inter-organisational context.

Third, our study has implications for practice. The decision is not 'either together or separate'. Managers have to decide *how much* togetherness to allow, *by what means* it will be administered (for example by setting time aside for group problem solving activities, and other centralised and decentralised mechanisms), and *how* the results of developing togetherness should be measured and rewarded. Huxham and Beech (2003) offer supporting evidence that raising awareness of the types of tension that frequently arise can enhance practitioners' ability to manage them in a way that is relevant to their situation. The practitioner literature is 'replete with articles that encourage firms to behave as integrated supply chains' (Swafford et al, 2006:184). Because coordination is characterised by ready reversibility and ongoing high investment of resources that are needed for maintenance and development, managers should be cautious about adopting RI relationships. It seems to us that the tendency to move to the right in figure 3 cannot be eliminated: the tendency to separate will always be there.

Finally, our study provides further insights into the under-researched phenomenon of intra-firm buyer-supplier relationships. While the intra-firm relationship was subject to similar logistical pressures, we found evidence of the difficulty of establishing the necessary routines to support inter-site coordination in a context of organizational separation and non-aligned incentives. So the two sites had to compromise, working together for the common good of the 'company' while being drawn apart by the self-interest of different reporting relationships and non-aligned incentives. Further special factors like geographical separation and cultural differences between the two plants led us to consider that this RI relationship was less well coordinated than the inter-firm case.

Because we focused on the logistics aspects of dyadic supply relationships, our study did not seek to address wider supply chain dimensions, notably in downstream directions. We made the assumption that principles from the literature on inter-organizational relationships could be applied to intra-firm relationships. We have focused primarily on the logistics-based relationships, and paid little attention to other aspects of relationships between firms. We researched only two such relationships, which makes it more difficult to draw general conclusions. This concern is illustrated by the obvious differences between the two cases, with the inter-firm case better coordinated than the intra-firm case. However, a rich picture can be drawn from comparing such differences: indeed, it allowed us to highlight elements of 'togetherness', 'separateness' and capability build up that appeared as inherent features of both relationships.

In terms of further research, we have focused on coordination of interdependent supply relationships. Our conclusions need to be tested not only in other interdependent supply relationships, but also in other aspects of relationships between firms. We have adopted a particular view of the supply relationship that is founded on the logistics process and the accompanying organizational factors. More investigation needs to be done about the influences of other business functions on the supply relationship. For example, we consider that further research is needed to assess the effects of the partners' internal human resource systems on the vulnerability and fragility of interdependent supply relationships.

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Appendix 1: Interview Guide

This interview guide was the result of several iterations; it was originally longer and more structured. The reason for starting with broad, open-ended questions (Question 1-3) was to encourage the informants to discuss the supply relationship as much as possible without being influenced by the researcher. Questions on the constructs derived from the framework for analysis were asked later (Question 4). This interview guide was later adapted to run interviews at the Tyrenco site.

The interview generally started with a brief presentation of the research project, credentials of the researcher and with a reassurance that the anonymity of the informant would be respected. Then the interview proceeded along following lines.

1. *What is your position and role? What are your activities and length in the job, what is your reporting line*?

The aim of this question was to allow the informant to briefly introduce himself and his position in his organization.

2. *How do you see your role in the supply relationship and how do you interface with the partner*?

The aim of this question was to locate the informant within the supply relationship and to understand the extent of his interaction with members of the partner organization (Who do you interact with? How often? Why? How?).

3. How would you describe the relationship? (Follow up questions: In what ways is it a partnership vs. a non-partnership relationship? What are the elements that reinforce or hinder the relationship? Provide specific examples of key events or issues. How have your seen the relationship evolve over time?)

The aim of this set of open-ended question was to allow the informant to describe the relationship in their own words, as much as possible without being influenced by the interviewer. The intent was to allow free emergence of various themes about the relationship without constraint from the framework for analysis.

4. What are the requirements of the supply relationship in terms of co-ordination?

5. *How would you specifically describe following factors of the supply relationship?*

The aim of this question was to allow the informants to describe the way they perceived the four factors.

- What can you say about **goals** within the relationship? (In what ways are goals shared or individual? In what ways are they clear or not? In what ways are they explicit or not?)
- What can you say about **information sharing** within the relationship (extent of and quality of the information exchanged)?
- What can you say about **co-ordination mechanisms** within the relationship? (Formal or informal, contract-related?).
- What can you say about **decision making** within the relationship (How clear is the decision making process? Are decisions made jointly or separately?)***?***

6. Is there anything else that you would like to add?